AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listing of claims in the application:

Listing of Claims:

Claims 1 to 58 (canceled).

59. (currently amended) A drilling method for the drilling of boreholes in the ground, in which is circulated a suitable discharge fluid, comprising generating an [[by the utilization of]] electric discharge [[generated]] by high-voltage pulses between electrodes of opposite polarity, wherein ~~at least one of~~ the following elements [[has]] have been incorporated:

i electrodes moveable relative to each other and [[the]] a drill-bit boss in a manner so that bottom-hole physical contact be secured for all the electrodes on all relevant bottom-hole topographies,

ii nozzle jetting of the circulating discharge fluid (with point of jetting impact on the hole-bottom and jetting vector direction specific relative to the actual discharge gaps) so as to lift and remove the primary cuttings instantly as they come loose and with pressure expansion across the nozzles at no less than 4MPa,

iii down-hole deployment of a minimum of one high-voltage pulse generator a minimum fixed distance from the drill-bit and supplied from the surface at a 1KV or other practical voltage level,

iv borehole cross-sectional excavation coverage by a combination of rotational or oscillatory movement of the drill-bit boss and a plurality of electrodes situated on the bit face along one or a few radii and tangents,

v ring-shaped hole-making with core storage, core transportation, down-hole closed loop discharge fluid circulation with prime mover energy supply, discharge fluid cleaning and cuttings' storage incorporated in it.

60. (previously presented) A method as set forth in claim 59, wherein the electrodes are moveable along or in parallel, or as a minimum have a component of their ability to move along or in parallel to the direction of drilling, relative to each other and the drill-bit boss so that bottom-hole physical contact be secured for all the electrodes on all relevant bottom-hole topographies.

61. (previously presented) A method as set forth in claim 59, wherein one electrode is fixed relative to the drill-bit boss and all the other electrodes are movable relative to each other and the drill-bit boss.

62. (previously presented) A method as set forth in claim 59, wherein the movable electrodes are pushed forward relative to the drill-bit boss and allowed to find their individual positions as they hit the bottom profile of the hole-bottom.

63. (previously presented) A method as set forth in claim 59, wherein the movable electrodes are at any time manipulated so that one shifting electrode pair or one shifting group of electrode pairs are in contact with the bottom hole profile and the other are in their retracted position out of contact with the bottom hole profile.

64. (previously presented) A method as set forth in claim 59, wherein the high-voltage electric discharge pulses are generated by a down-hole pulse generator situated near, at a fixed distance from the drill-bit and following behind the drill-bit as the borehole deepens.

65. (previously presented) A method as set forth in claim 59, wherein the high-voltage electric discharge pulses are generated by a plurality of down-hole pulse generators situated near, at a fixed distances from the drill-bit, and following behind the drill-bit as the borehole deepens.

66. (previously presented) A method as set forth in claim 59, wherein all electrode gaps are electrically connected in parallel on equal terms to the pulse generator or generators.

67. (previously presented) A method as set forth in claim 59, wherein the electrode gaps are electrically connected in series on otherwise equal terms to the pulse generator receiving individually dedicated pulses staggered in time.

68. (previously presented) A method as set forth in claim 59, wherein the electrode gaps are electrically connected each to their dedicated pulse generator receiving pulses wholly, or partially independent of the other electrode gaps or according to a predetermined pulse distribution program.

69. (previously presented) A method as set forth in claim 59, wherein groups of electrode gaps are electrically connected each to their dedicated pulse generator and each electrode in a group receiving pulses in series within the group and wholly, or partially independent of the other groups or according to a predetermined pulse distribution program among the groups.

70. (previously presented) A method as set forth in claim 59, wherein each electrode pair or group of electrode pairs have their individual cable connection to their pulse generator.

71. (previously presented) A method as set forth in claim 59, wherein all electrode pairs or all groups of electrode pairs have wholly or partially common cable connection to their pulse generators and the individual pulse destination is given by a switching arrangement.

72. (previously presented) A method as set forth in claim 59, wherein directed high-pressure discharge fluid jetting is undertaken said direction being achieved by nozzles mounted on the face of the bit boss.

73. (previously presented) A method as set forth in claim 59, wherein the jetting pressure expanded across the nozzles is not less than 4MPa.

74. (previously presented) A method as set forth in claim 59, wherein the jetting has points and direction of impact on the hole-bottom specific for each electrode gap so as to lift and remove the primary cuttings instantly as they come loose from their indigenous place in the rock matrix .

75. (previously presented) A method as set forth in claim 59, wherein is defined a priority direction for cuttings' removal out from under the bit.

76. (previously presented) A method as set forth in claim 59, wherein the priority direction for cuttings' removal out from under the bit is radial away from the hole centre.

77. (previously presented) A method as set forth in claim 59, wherein the priority direction for cuttings' removal out from under the bit is along a straight line or as near to a straight line as possible angled away from said radial direction as little as possible yet so that other electrodes on the bit face do not constitute a hindrance for any cuttings' exit out from under the bit or so that said hindrance is minimized.

78. (previously presented) A method as set forth in claim 59, wherein the priority direction for cuttings' removal out from under the bit is angled away from the radial direction opposite the direction of rotational movement .

79. (previously presented) A method as set forth in claim 59, wherein the vector direction of each jet is made to coincide or as nearly coincide as possible, with the direction of the crack formed as the primary cutting is broken loose as seen along the priority direction for cuttings removal out from under the bit.

80. (previously presented) A method as set forth in claim 59, wherein open channels or grooves are cut in the face of the drill-bit boss to allow passage for the cuttings along the priority directions of cuttings' removal out from under the bit.

81. (previously presented) A method as set forth in claim 59, wherein the high-voltage electric pulse generation is undertaken in the borehole at a fixed distance from the drill-bit as the drilling proceeds with its energy supply at a practical voltage level, from the surface or elsewhere.

82. (previously presented) A method as set forth in claim 59, wherein the high-voltage electric pulse generation is done by one pulse generator and all electrode gaps are hooked up in parallel on equal terms.

83. (previously presented) A method as set forth in claim 59, wherein the high-voltage electric pulse generation is done by one pulse generator and the electrode gaps are hooked up in series, each pulse having one dedicated electrode gap as its destination.

84. (previously presented) A method as set forth in claim 59, wherein the high-voltage electric pulse generation is done by one pulse generator and the electrode gaps are organized in groups which are served by the pulse generator in series, the electrode gaps in each group receiving the pulses in parallel on equal terms.

85. (previously presented) A method as set forth in claim 59, wherein the high-voltage electric pulse generation is done by two or more pulse generators and the electrode gaps are organized in one or a plurality of groups each group hooked up to one generator and the electrodes in each group being served in parallel or in series.

86. (previously presented) A method as set forth in claim 59, wherein the high-voltage electric pulse generation is done by a plurality of pulse generators and each electrode gap is served by its dedicated pulse generator.

87. (currently amended) A method as set forth in claim 59, wherein the drill-bit boss or a part of the drill-bit boss is given forced physical movement relative to the hole-bottom, and wherein at least one of the following modes of motion has been incorporated:

i one direction rotational movement of even speed;

ii one direction intermittent rotational movement;

iii one direction continual rotational movement with speed variation of any kind;

iv two direction continual oscillatory rotational movement of any frequency, amplitude or energy level;

v two direction intermittent oscillatory rotational movement of any frequency, amplitude, energy level or kind of intermittence;

vi two direction oscillatory linear movement in the axial direction of the borehole, of any frequency, amplitude, energy level, kind of intermittence or kind of interaction with the hole-bottom.

88. (previously presented) A method as set forth in claim 59, wherein physical interaction between the bit boss and the hole-bottom occurs as caused by the drill-bit movement in the form of cutting, scraping, hammering or any other kind of physical interaction.

89. (previously presented) A method as set forth in claim 59, wherein part of the face of the drill-bit boss has been given a layout wherein at least one of the following details has been incorporated:

i facial profiling of the drill-bit boss so as to create efficient interaction with the hole-bottom;

ii facial insertion of hard, sharp, abrasive, durable or in any other way suitable design elements so as to contribute to the lasting and efficient excavation and removal of loose cuttings from the hole-bottom.

90. (previously presented) A method as set forth in claim 59, wherein the borehole is created by a sequence of operations in which

i the drilling of an annulus-shaped bore-hole segment of finite length allowing the solid core to rise inside a core barrel;

ii the circulation of discharge drilling fluid from a pump situated at the surface, down the hole through the drill-string, through nozzles incorporated in the ring-shaped drill-bit, up the annulus surrounding the bottom hole assembly and drill-string to the surface,

into the discharge fluid tanks and its integrated fluid separation and cleaning system; thereafter back to the suction side of the pump for re-circulation;

iii the in-situ cutting in the core barrel of the core at or near its root;

iv the attachment of the core to the core barrel;

v the hoisting to the surface of the entire bottom hole drilling assembly including the core, the core barrel and the drill-string;

vi the removal of the core from the core barrel;

vii the lowering of the entire bottom hole drilling assembly back to the hole bottom for sequence repetition.

91. (previously presented) A method as set forth in claim 59, wherein the borehole is created by the a sequence of operations in which

i the drilling of an annulus-shaped bore-hole segment of finite length allowing the solid core to rise inside a core barrel;

ii the circulation of discharge drilling fluid from a pump situated in the bottom hole assembly, through nozzles in the ring-shaped drill-bit, up the annulus surrounding the bottom hole assembly to the entry section of a cuttings' basket situated at the top of the bottom hole assembly, into the basket and its integrated fluid separation and cleaning system; thereafter back to the suction side of the pump for re-circulation;

iii the in-situ cutting in the core barrel of the core at or near its root;

iv the attachment of the core to the core barrel;

v the hoisting to the surface of the entire bottom hole drilling assembly including the core, the core barrel and the cuttings' basket;

vi the removal of the core from the core barrel and the cuttings from the basket;

vii the lowering of the entire bottom hole drilling assembly back to the hole bottom for sequence repetition.

92. (currently amended) A drilling machine for the drilling of boreholes in the ground, in which is circulated a suitable discharge fluid, by the utilization of electric discharge generated by high-voltage pulses between electrodes of opposite polarity, wherein

[[at least one of]] the following elements [[has]] have been incorporated in the overall machine

i a drill-bit with movable electrodes relative to each other and the drill-bit boss in a manner so that bottom-hole physical contact be secured for all the electrodes on all relevant bottom-hole topographies;

ii pointed hydraulic nozzles for nozzle jetting of the circulating fluid (with point of jetting impact on the hole-bottom and jetting vector direction specific relative to the actual discharge gaps) so as to lift and remove the primary cuttings instantly as they come loose and with pressure expansion across the nozzles at no less than 4MPa;

iii a minimum of one high-voltage pulse generator deployed down-hole at a minimum fixed distance from the drill-bit and supplied from the surface at a 1KV or other practical voltage level;

iv a rotating or oscillating bit causing the borehole cross-sectional excavation coverage to occur by a combination of rotational or oscillatory movement of the drill-bit boss and electric discharge between a plurality of electrodes situated on the bit face along one or a few radii and tangents;

v a bottom hole assembly for ring-shaped hole-making with core storage, core transportation, down-hole closed loop discharge fluid circulation with prime mover energy supply, discharge fluid cleaning and cuttings' storage incorporated in it.

93. (previously presented) A drill-bit for a drilling machine according to claim 92, for the drilling of a borehole in the ground by the utilization of electric discharge generated by high-voltage pulses between a minimum of two electrodes (4,5) of opposite polarity said bit 1 composed of a bit boss (3) wherein are incorporating channels (6) for a suitable discharge fluid to flow from a channel inlet (27) on the back side of the bit (1) to exchangeable nozzles (7) incorporated at the face of the bit (1) and open channels (26) at the surface of the boss (3) for cuttings' transportation from each gap between electrodes (4,5) of opposite polarity to the periphery of the bit 1, and fixtures (8,17,19) by which the electrodes (4,5) are connected to the boss (3), said electrodes being divided in one set of high voltage electrodes 4 and one set of ground electrodes (5) each electrically connected to a terminal (27) at the back side of the bit (1), wherein

i the electrodes (4,5) are all moveable relative to each other and the drill-bit boss 3 so that bottom-hole contact may be obtained at all times for all the electrodes on all relevant bottom-hole topographies;

ii the electrodes (4,5) are all but one individually moveable relative to each other and the drill-bit boss 3 so that bottom-hole contact be obtained at all times for all the electrodes on all relevant bottom-hole topographies.

94. (previously presented) A drill-bit as set forth in claim 93, wherein the mode of electrode motion is according to one or a combination of the following alternatives

i forward movement only of all the movable electrodes (4,5), along or at least with a component of their movement along axis' parallel to the direction of drilling as caused by a force or a combination of forces;

ii controlled forward and backward individual movement of each movable electrode (4,5) along or at least with a component of their movement along axis' parallel to the direction of drilling causing each electrode (4,5) to move according to an imposed impulse;

iii movement in any other way or combination of ways so that bottom-hole contact may be obtained at all times for all the electrodes on all relevant bottom-hole topographies.

95. (previously presented) A drill-bit for a drilling machine as set forth in claim 92, wherein the mode of electrode movement is along or at least with a component of their movement along axis' parallel to the direction of drilling and according to one or a combination of the following alternatives, wherein

i all moveable electrodes (4,5) to move forward and find their individual positions as they hit each their point of contact on the bottom profile of the borehole;

ii advancing the movable electrodes individually forward or retracting them individually backward, the electrodes normally but not necessarily either being in their fully retracted position or forward in individual positions as given by their contact with the bottom profile of the borehole.

96. (previously presented) A drill-bit for a drilling machine as set forth in claim 92, wherein the means of electrode operation are according to one or a combination of the following alternatives

i one-way actuation of each movable electrode forward in the borehole;

ii two-way actuation of each movable electrode forward and backwards in the borehole;

97. (previously presented) A drill-bit for a drilling machine as set forth in claim 92, wherein the means of electrode motion are one or a combination of the following alternatives

i one-way hydraulic actuation forward in the borehole of each movable electrode (4,5) said electrode (4,5) configured as a plunger in a hydraulic cylinder fixture (8) with the cylinder fixed on the drill-bit boss (3) axially in parallel with the direction of drilling and in which the plunger will move forward when hydraulic pressure is applied behind it;

ii two-way hydraulic actuation of each movable electrode (4,5) said electrode configured as a piston in a hydraulic cylinder fixture 8 with the cylinder (8) fixed on the drill-bit boss 3 axially in parallel with the direction of drilling and in which the piston will move forward when hydraulic pressure is applied behind it and backward when pressure is applied in the opposite direction on a ring surface incorporated for that purpose.

98. (previously presented) A drill-bit for a drilling machine as set forth in claim 92, wherein the means of electrode motion comprise one-way mechanical actuation forward in the borehole of each movable electrode (4,5) said electrode configured as a body of cylindrical, annular, prismatic or other cross-section and situated inside a hollow fixture (8) with hydraulic pressure equalized on all its surfaces, said fixture having cross-section similar to said electrode and incorporating a helical or other compressed spring (17) internally between its bottom and said electrode, and said hollow fixture being fixed on the drill-bit boss (3) axially in parallel with the direction of drilling, said compressed spring (17) causing the electrode to be moved forward in the fixture until stopped by outside forces or an end stop (54) incorporated in the fixture near its opening.

99. (previously presented) A drill-bit 1 for a drilling machine as set forth in claim 92, wherein the means of electrode motion are one or a combination of the following alternatives

i one-way hydraulic actuation forward in the borehole of each movable electrode 4,5 said electrode 4,5 configured as an integral part of an arm 19 hinged on the drill-bit boss 3 and connected to a plunger 55 in a hydraulic cylinder fixture 8 fixed on the drill-bit boss 3, said arm 19 rotating around its axis in such a way that the movement of the electrode 4,5 will have a component in the axial forward direction in parallel with the direction of drilling when the plunger 55 is caused to move forward in the cylinder as hydraulic pressure is applied behind it;

ii two-way hydraulic actuation of each movable electrode 4,5 said electrode 4,5 configured as an integral part of an arm 19 hinged on the drill-bit boss 3 and connected to a piston 21 in a hydraulic cylinder fixture 8 fixed on the drill-bit boss 3, said arm 19 rotating around its axis in such a way that the movement of the electrode 4,5 will have a component in the axial direction, forward or backward in parallel with the direction of drilling as the piston 21 is caused to move forward when hydraulic pressure is applied behind it and backward when pressure is applied in the opposite direction in the pressure chamber 22 incorporated for that purpose.

100. (previously presented) A drill-bit 1 for a drilling machine as set forth in claim 92, wherein the means of electrode motion comprises one-way mechanical actuation forward in the borehole of each movable electrode 4,5 said electrode 4,5 configured as an integral part of an arm 19 hinged on the drill-bit boss 3 and connected to a body 58 of cylindrical, annular, prismatic or other cross-section and situated inside a hollow fixture 8 with hydraulic pressure equalized on all its surfaces, said fixture having cross-section similar to said body 58 and incorporating a helical or other compressed spring 17 internally between its bottom and said body 58, and said hollow fixture being fixed on the drill-bit boss 3, said arm 19 rotating around its axis in such a way that the movement of the electrode 4,5 will have a component in the axial forward direction in parallel with the direction of drilling as said compressed spring causes the body 58 to be moved forward in the fixture until stopped by outside forces or an end stop 54 incorporated in the fixture near its opening.

101. (previously presented) A drill-bit 1 for a drilling machine as set forth in claim 92, wherein the means of electrode motion comprises one-way mechanical actuation forward in the borehole of each movable electrode 4,5 said electrode 4,5 configured as an integral part of an arm 19, said arm itself being configured as a spring with characteristics such as but not limited to a blade spring and fixed on the drill-bit boss 3 in such a way that the movement of the electrode 4,5 as a minimum will have a component in the axial forward direction in parallel with the direction of drilling as said spring-arm moves to unload its spring-force until stopped through contact with the hole bottom topography or because the spring has totally unloaded itself.

102. (previously presented) A drill-bit for a drilling machine as set forth in claim 93, wherein the projection on a plane normal to the direction of drilling of the face of the bit has a contour selected from the group consisting of a circle, a polygon, and any other type of contour characterized by a single closed line.

103. (previously presented) A drill-bit for a drilling machine as set forth in claim 93, wherein the projection on a plane normal to the direction of drilling of the face of the bit has a contour selected from the group consisting of two closed lines, one inside the other so as to describe a ring-shaped cross-sectional area in the form of two circles, polygons or any other combination of closed line contours, one inside the other.

104. (previously presented) A drill-bit 1 for a drilling machine as set forth in claim 92, wherein the open channels 26 have a cross-sectional area 59 big enough to allow primary cuttings as caused by said drill-bit 1 to flow through them and direction 13 so as for all cuttings to have left the area 2 under the drill-bit 1 as early as possible after their initial separation from the rock matrix 61, said direction 13 constituting the priority direction of cuttings movement for each electrode gap on the drill-bit 1 and being defined by but not limited to one or a combination of the following criteria

i straight-line radial cuttings movement away from the centre of the bit 1 in the direction of its periphery;

ii straight-line or as near as possible to a straight-line cuttings movement in a direction or a combination of directions angled as little as possible away from the outwardly radial and yet directed so as for the cuttings to avoid impact or impact as little as possible with any potential hindrance present at the face of the bit such as but not limited to electrodes 4,5 or nozzles 7, on their travel from the electrode gap where they originated to the periphery of the bit 1;

iii cuttings movement away from the rotational direction or the next active electrode gap or gaps as may be relevant for each specific bit.

105. (previously presented) A drill-bit 1 for a drilling machine according to claim 92 for the drilling of a borehole in the ground by the utilization of electric discharge generated by high-voltage pulses between a minimum of two electrodes 4,5 of opposite polarity said bit 1 composed of a boss 3, wherein is incorporated channels 6 for a suitable discharge fluid to flow from a channel inlet 27 on the back side of the bit 1 to exchangeable nozzles 7 incorporated at the face of the bit 1 and open channels 26 with cross-sectional area 59 cut on the surface of the boss 3 for cuttings transportation from each gap between electrodes 4,5 of opposite polarity to the periphery of the bit 1, said electrodes being divided in one set of high voltage electrodes 4 and one set of ground electrodes 5 each electrically connected to a terminal 27 at the back side of the bit 1 wherein the exchangeable nozzles 7 are mounted on the face of the drill-bit boss 3 so that the fluid jets 52 with position and vector direction 14,15,16 originating from them aim in such direction that a maximum probability is created for each primary cutting to be instantly lifted and removed from its inherent place as a part of the rock matrix 51 upon separation from said matrix and made to exit as fast as possible from the area 50 under the drill-bit.

106. (previously presented) A drill-bit 1 for a drilling machine as set forth in claim 105, wherein said maximum probability for the lift and removal of each primary cutting instantly upon separation from the matrix is secured by nozzle 7 placement and direction so as to cause direct impact by a minimum of one fluid-jet 52 in the crack created between the cutting and the rock matrix as the cutting is initially broken loose.

107. (previously presented) A drill-bit 1 for a drilling machine as set forth in claim 105, wherein the vector direction 15,16 of the fluid jet at the moment of impact is along the direction of a tangent at the point of impact to the surface contour of the primary cutting as seen in said vector direction or as close to said tangent as practically possible.

108. (previously presented) A drill-bit 1 for a drilling machine as set forth in claim 104, wherein the vector direction 15,16 of the fluid jet at the moment of impact is composed of two vector components one of which is parallel to the priority direction of cuttings' transport out from under the bit for the subject electrode gap, said parallel component preferably but not necessarily being the major of the two components.

109. (previously presented) A drill-bit 1 for a drilling machine as set forth in claim 103, wherein said nozzles 7 are constructed according to one of the following principles or a combination of them, wherein

i each of said nozzles 7 having its fluid flow permanently pointed in one and the same direction relative to the bit boss 3;

ii each of said nozzles 7 having its fluid flow divided in two or more directions said directions each permanently pointed in one and the same direction relative to the bit boss 3;

iii said nozzles 7 being constructed so that the fluid jet originating from them may be directed in different directions at different times, such as but not limited to the lift and removal of different primary cuttings which come loose at different time or the extended jetting of a primary cutting along its priority direction of cuttings' removal path.

110. (previously presented) A drill-bit 1 for a drilling machine as set forth in claim 103, wherein the fluid flow through the nozzles 7 is given sufficient hydraulic power to lift the primary cuttings instantly upon hydraulic impact from their cavities or lift them in a minimum of time, said hydraulic power P to be as given by the mathematical expression PKW = 530 o D2,3 for all the nozzles 7 combined and where D (m) represents the borehole diameter, and cause a minimum of 3,5MPa of pressure drop across each nozzle 7.

111. (previously presented) A bottom hole assembly 42 according to claim 92 for the drilling of boreholes in the ground, in which is circulated a suitable discharge fluid, by the utilization of electric discharge generated by high-voltage pulses between electrodes 4,5 of opposite polarity, wherein is incorporated the drill-bit 1 and a high-voltage pulse generator or a plurality of such generators 31 wherein the pulse generator 31 or pulse generators 31 each, is mounted in a fixed axial distance from the drill-bit 1 and behind as seen in the direction of drilling, and connected to it in the ways necessary, such as but not limited to electrically, hydraulically and mechanically, and wherein said distance is as short as possible and remains constant regardless of the bore-hole depth.

112. (previously presented) A bottom hole assembly 42 according to claim 92 for the drilling of boreholes in the ground, in which is circulated a suitable discharge fluid, by the utilization of electric discharge generated by high-voltage pulses between electrodes 4,5 of opposite polarity, wherein is incorporated the drill-bit 1 and a high-voltage pulse generator or a plurality of such generators 31 situated relative to the drill-bit in a position characterized by that the bit and the generator or generators remain in a fixed or near fixed position relative to each other with only a short distance between them as the drilling makes progress, further comprising a plurality of sub-systems such as but not limited to a combination of all or some of the following items

i rotational power 33 for the purpose of creating rotational movement of the drill-bit 1, in the form of one direction fixed or variable speed rotation, oscillatory of any kind, intermittent rotational or oscillatory or any kind of rotational or other movement and made available by a suitable motor, hydraulic, electric or otherwise driven situated relative to the drill-bit in a position characterized by that the bit and the motor remain in a fixed or near fixed position relative to each other with only a short distance between them as the drilling makes progress;

ii a core barrel 36 of fixed length incorporating a core cutter 37 near its bottom and a core gripper 38 said core barrel unit situated relative to the drill-bit in a position characterized by that the bit and the core barrel remain in a fixed or near fixed position adjacent to each other as the drilling makes progress;

iii a cuttings separation 41 and temporary storage system 40 herein called cuttings' basket wherein the cuttings are segregated away from the discharge fluid and temporarily stored while cleaned discharge fluid is guided to a suction tank for re-circulation in the bottom section of the borehole said system situated relative to the drill-bit in a position characterized by that the bit and cuttings' separation and temporary storage system remain in a fixed or near fixed position relative to each other as the drilling makes progress;

iv a discharge fluid circulating pump 39 whereby the discharge fluid is circulated in a closed bottom hole loop characterized by a flow-path generally axial to the borehole towards the hole-bottom, from the pressure side of the bottom hole circulating pump 39, through or past the components of the bottom hole assembly such as but not limited to and not necessarily in such order, through or past the motor 33, through or past the drilling process control and actuator system 32, through or past the pulse generator 31 or pulse generators 31, through or past the drill-bit 1 boss, out onto the hole bottom through the nozzles 7 and along the open channels on the drill-bit face in the priority cuttings' exit direction 13, returning by a switch of direction said direction being generally axial to the borehole away from the hole-bottom through channels made for this purpose in the said components of the bottom-hole assembly 42 or past the said components in the annulus surrounded by the bore-hole and said bottom-hole assembly 42 carrying with it the cuttings in suspension to the top of the cutting's basket 40 again making a switch of direction in favour of the original flow path direction said previously presented direction being generally axial to the borehole towards the hole-bottom, through the fluid cleaning section 41 of the cuttings' basket 40 wherein the cuttings are separated from the fluid and segregated for temporary storage in the basket 40, finally through a cleaned discharge fluid suction tank 58 from where the discharge fluid returns to the suction side of the pump 39, said pump situated relative to the drill-bit in a position characterized by that the bit and the pump remain in a fixed or near fixed position relative to each other as the drilling makes progress;

v a drilling process control unit 57 wherein is incorporated details such as but not limited to borehole information sampling and processing systems and a control and actuator system 32, computer based electro-hydraulic or other for the drilling operations such as but not limited to the electrode 4,5 management and positioning, the nozzles' 7 control for hydraulic impact direction and management by the coordination of electric discharge, the

discharge fluid energy and volume flow in combination with or exclusive of bit movement and core barrel 36 management said control unit situated relative to the drill-bit in a position characterized by that the bit and the control unit remain in a fixed or near fixed position relative to each other with only a short distance between them as the drilling makes progress;

vi a connecting terminal 55 for a pipe conduit 44 to the surface, said terminal further characterized by that it facilitates the transfer of the discharge fluid and incorporates the electric power and signal transmission 45,46 to the bottom hole assembly;

vii a connecting terminal 55 to a line conduit such as but not limited to a steel wire-rope 65 with integrated electric power and signal cables 45,46 said terminal characterized by that it incorporates facilities for the electric power and signal transmission 45,46 from the surface to the bottom hole assembly.

113. (previously presented) A bottom hole assembly 42 according to claim 92 for the drilling of boreholes in the ground, in which is circulated a suitable discharge fluid, by the utilization of electric discharge generated by high-voltage pulses between electrodes 4,5 of opposite polarity, wherein is incorporated the drill-bit 1 and a high-voltage pulse generator or a plurality of such generators 31 situated relative to the drill-bit in a position characterized by that the bit and the generator or generators remain in a fixed or near fixed position relative to each other with only the core barrel 36 between them as the drilling makes progress, further comprising a plurality of sub-systems such as but not limited to

i a core barrel 36 of fixed length incorporating a core cutter 37 near its bottom and a core gripper 38 said core barrel unit situated relative to the drill-bit in a position characterized by that the bit and the core barrel remain in a fixed or near fixed position adjacent to each other as the drilling makes progress;

ii rotational power 33 for the purpose of creating rotational movement of the drill-bit 1, in the form of one direction fixed or variable speed rotation, oscillatory of any kind, intermittent rotational or oscillatory or any kind of rotational or other movement and made available by a suitable motor, hydraulic, electric or otherwise driven situated relative to the drill-bit in a position characterized by that the motor remain in a fixed or near fixed position adjacent to the pulse generator or generators 31 as the drilling makes progress;

iii a drilling process control unit 57 wherein is incorporated details such as but not limited to borehole information sampling and processing systems and a control and

actuator system 32, computer based electro-hydraulic or other for the drilling operations such as but not limited to the electrode 4,5 management and positioning, the nozzles' 7 control for hydraulic impact direction and management by the coordination of electric discharge, the discharge fluid energy and volume flow in combination with or exclusive of bit movement and core barrel 36 management said control unit situated relative to the drill-bit in a position characterized by that the control unit remain in a fixed or near fixed position said position being adjacent to or in the immediate proximity of and above the motor 33 as seen from the drill-bit as the drilling makes progress;

iv a discharge fluid circulating pump 39 whereby the discharge fluid is circulated in a closed bottom hole loop characterized by a flow-path generally axial to the borehole towards the hole-bottom, from the pressure side of the bottom hole circulating pump 39, through or past the components of the bottom hole assembly such as but not limited to and not necessarily in such order, through or past the drilling process control and actuator system 32, through or past the motor 33, through or past the pulse generator 31 or pulse generators 31, through or past the core barrel 36, through or past the drill-bit 1 boss, out onto the hole bottom through the nozzles 7 and along the open channels on the drill-bit face in the priority cuttings' exit direction 13, returning by a switch of direction said previously presented direction being generally axial to the borehole away from the hole-bottom through channels made for this purpose in the said components of the bottom-hole assembly 42 or past the said components in the annulus surrounded by the bore-hole and said bottom-hole assembly 42 carrying with it the cuttings in suspension to the top of the cutting's basket 40 again making a switch of direction in favour of the original flow path direction said previously presented direction being generally axial to the borehole towards the hole-bottom, through the fluid cleaning section 41 of the cuttings' basket 40 wherein the cuttings are separated from the fluid and segregated for temporary storage in the basket 40, finally through a cleaned discharge fluid suction tank 58 from where the discharge fluid returns to the suction side of the pump 39, said pump situated relative to the drill-bit in a position characterized by that the pump remain in a fixed or near fixed position said position being adjacent to or in the immediate proximity of and above the drilling process control unit 57 as seen from the drill-bit as the drilling makes progress;

v a cuttings' separation 41 and temporary storage system 40 herein called cuttings' basket wherein the cuttings are segregated away from the discharge fluid and temporarily stored while cleaned discharge fluid is guided to a suction tank for re-circulation in the bottom section of the borehole said system situated relative to the drill-bit in a position characterized by that the cuttings' separation and temporary storage system remain in a fixed or near fixed position said position being adjacent to or in the immediate proximity of and above the discharge fluid circulating pump 39 as seen from the drill-bit as the drilling makes progress;

vi a connecting terminal 55 to a line conduit such as but not limited to a steel wire-rope 65 with integrated electric power and signal cables 45,46 said terminal characterized by that it incorporates facilities for the electric power and signal transmission 45,46 from the surface to the bottom hole assembly and further characterized by that the terminal remain in a position said position being adjacent to or in the immediate proximity of and above the the cuttings' separation and temporary storage system 41 as seen from the drill-bit thereby constituting the termination of the bottom hole assembly as seen from the drill-bit side.

114. (previously presented) A bottom-hole assembly 42 as set forth in claim 112 wherein the pulse generator or generators 31 have been made so as to allow the flow of discharge fluid to flow past according to one or a combination of the following alternatives

i an internal conduit allowing the fluid to flow into the borehole through the generator body or sequence of bodies and out of the borehole through the annulus created by the borehole and the outer periphery of the generator body or sequence of bodies;

ii an external conduit, circular, annular or of any other cross-sectional form, allowing the fluid to flow into the borehole around the generator body or bodies and out of the borehole through the annulus created by the wall of the borehole and the outer periphery of the generator body including said external fluid conduit or sequence of bodies.

115. (previously presented) A drilling machine 43 according to claim 92 for the drilling of boreholes in the ground, in which is circulated a suitable discharge fluid from the surface, by the utilization of electric discharge generated by high-voltage pulses between

electrodes of opposite polarity, said machine characterized by a bottom hole assembly 42, and comprising a plurality of sub-systems such as but not limited to a combination of all or some of the following items

i a pipe conduit 44 connecting the upper extension 55 of the bottom hole assembly to the surface said conduit, wherein said conduit facilitates the transfer of the discharge fluid and incorporates the electric power and signal transmission 45,46 to the bottom hole assembly;

ii a steel wire rope 65 connecting the upper extension 55 of the bottom hole assembly to the surface said wire rope, wherein said wire rope facilitates the transfer of the electric power and signal transmission 45,46 between the surface and the bottom hole assembly;

iii a discharge fluid circulating pump 62 or a plurality of such pumps 62 said pumps having sufficient capacity to supply the volumes of discharge fluid at the necessary pressure as set forth by the operating characteristics of the drill-bit 1 and the dimensions of the borehole, and wherein the pumps are situated at the surface above the borehole.

iv hoisting and handling capability 48,49 and power 47 to lower and lift the bottom hole assembly 42 and the borehole pipe conduit 44 or steel wire rope 65 routinely into and out of the borehole and further characterized by that the hoisting and handling facilities are situated at the surface above the borehole;

v electric power generation and transforming capability 47 sufficient to power all bottom-hole assembly 42 functions and surface power requirements said bottom-hole assembly power to be transferred through the borehole at a practical voltage level such as 1000VAC but not necessarily limited to this exact value, and wherein the power and transforming facilities are situated at the surface above the borehole;

vi a discharge fluid composed of diesel or transformer oil or another oil or composition of oils with similar permittivity and wherein may be mixed one or a combination of the following substances;

i a discharge fluid specific-gravity regulator for the purpose of borehole pressure control and in the form of a suitable mineral such as but not limited to barite;

ii a viscosity regulator for the purpose of improved lifting of cuttings to the surface such as but not limited to a polymer composite, said discharge fluid further

characterized by that its storage and handling facilities are situated at the surface above the borehole;

vii a discharge fluid flow scheme characterized by a flow path from the surface to the drill-bit 1 and back to the surface, said flow path being internal in a tube 44 down the borehole through a terminal connection 55 at said bottom hole assembly's 42 upper extension, through or past the motor 33, through or past the drilling process control and actuator system 32, through or past the pulse generator 31 or pulse generators 31, through or past the drill-bit 1 boss, through the nozzles 7 and along the open channels on the bit face in the preferred cuttings' exit direction 13 returning by a switch of direction said previously presented direction being generally axial to the borehole away from the hole-bottom back to the surface past the bottom hole assembly 42 in the annulus surrounded by the bore-hole and said bottom-hole assembly 42 and past said tube 44 in the annulus surrounded by the bore-hole and said tube 44 carrying with it the cuttings in suspension to the surface and said discharge fluid flow scheme further characterized by that it receives an energy charge from the pumps at the surface above the borehole in sufficient quantities to complete its flow loop with volume flow and pressure drops as necessary;

viii a discharge fluid cleaning, mixing and holding system 61 in compliance with good health and environmental standards and the relevant law characterized by that the system is situated at the surface above the borehole;

ix a borehole pressure control and management system 56 as may be deemed necessary for the purpose of handling excessive borehole pressures characterized by that the pressure control system is situated at the surface above the borehole;

x a borehole information sampling and processing system and facilities for drilling process control 56 characterized by that the information sampling, processing and drilling control systems are situated at the surface above the borehole.

116. (previously presented) A drilling machine 43 according to claim 92 for the drilling of boreholes in the ground by the utilization of electric discharge generated by high-voltage pulses between electrodes 4,5 of opposite polarity, said machine characterized by a bottom hole assembly 42 and surface drilling support machinery 47,48,53,56 said

surface drilling support machinery incorporating a combination of all or some the following sub-systems, wherein

i a hoisting and handling system 48,53 to lower and lift the bottom hole assembly 42 and steel wire rope 65 routinely into and out of the borehole and further characterized by that the hoisting and handling system is situated at the surface above the borehole;

ii electric power generation and transforming capability 47 sufficient to power all bottom-hole and surface power requirements and further characterized by that power generation system is situated at the surface above the borehole;

iii borehole information sampling and processing capability 56, and facilities for drilling process control working in conjunction with the similar down-hole drilling control and steering system and further characterized by that said control system is situated at the surface above the borehole;

iv a storage supply of discharge fluid composed of diesel or transformer oil or another oil or composition of oils with similar permittivity, specific gravity regulators for the purpose of borehole pressure control if necessary and in the form of a suitable mineral such as but not limited to barite, viscosity regulators for the purpose of improved lifting of cuttings to the surface if necessary such as but not limited to polymer composites and other optional composition elements as may from time to time be required and further characterized by that the hoisting and handling system is situated at the surface above the borehole and further characterized by that the storage system is situated at the surface above the borehole and serving in a supplementary role to the down-hole circulating system;

v a discharge fluid handling system 61 in compliance with good health and environmental precautionary standards and the relevant law and further characterized by that the discharge fluid handling system is situated at the surface above the borehole;

vi a borehole pressure control and management system 56 as may be deemed necessary for the purpose of handling excessive borehole pressures, and further characterized by that the hoisting and handling system is situated at the surface above the borehole;

and wherein the discharge fluid circulation takes place only in a limited loop at the bottom of the hole said circulation loop extending from said bottom roughly to the top of said

bottom-hole assembly 42 while the rest of the borehole remains empty or fluid-filled as may be required by the surrounds of the borehole or other considerations.